THE EFFECTS OF OFFICE NOISE UPON DECISIONS MADE IN A PERSONNEL MANAGER SIMULATION

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THE EFFECTS OF OFFICE NOISE UPON DECISIONS

MADE IN A PERSONNEL MANAGER SIMULATION

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SUMMARY

The effects of noise on human physiology and behavior has become an important subject for study. The enactment of Federal regulations, such as the Walsh-Healey Act and the Noise Control Act of 1972, have spotlighted the importance of noise and its effects in the industrial environment. Prolonged exposure to high-intensity noise has been shown to cause serious damage to the human auditory mechanism, resulting in temporary or permanent hearing loss (Kryter, 1970).

Research has shown that environmental variables such as temperature and crowdedness have significant effects on interpersonal judgments. Noise is an environmental variable that has been shown to have certain detrimental effects on the performance of complex tasks.

Twenty personnel administrators and forty undergraduate students were randomly assigned to one of two conditions (Noise or Quiet) in a personnel manager simulation experiment. Recorded typical office noise was used for this experiment. Subjects were given a preliminary, 15-minute reading task, then they were asked to recommend starting salaries for six bogus applicants; and, at the end of the experiment, subjects were asked to complete an annoyance scale for noise.

Using a 2 X 2 factorial analysis of variance, it was found that subjects in the Noise condition (75 $\pm$ 5 dB) recommended significantly lower ($p < .01$) starting salaries than subjects in the Quiet condition (55 $\pm$ 5 dB). The annoyance scale scores were also significantly higher ($p < .01$) for subjects in the Noise condition. Through analysis of covariance, it was found that noise still had a significant effect ($p < .01$) on the recommended salaries after partialling out the annoyance effect.

These findings raise important questions concerning the variables involved in the effects of noise on task performance, and also offers evidence that tends to contradict the conclusions of some researchers (e.g. Kryter, 1970) who have stated that noise *per se* has no detrimental effect on mental or psychomotor tasks.

CHAPTER I

NOISE: HISTORICAL CONCERN

Noise, although a very popular topic today, is hardly a new concern for society. It has apparently been a problem for most of mankind's existence. There is reportedly an ordinance enacted some 2,500 years ago by the ancient Greek Community of Sybaris banning metal works and the keeping of roosters within the city to protect against noise that interfered with speech and might disturb sleep (U.S. Environmental Protection Agency, 1973). The effects of noise upon human physiology and behavior has become an important subject for study. A statement by the President to the Congress of the United States (on July 9, 1970) points out the urgency of reducing environmental pollution in all its forms: air, water, thermal, land (solid waste), and noise. Of all these forms of pollution, noise is perhaps the most insidious because of its intermittent nature and because its aftermath, however damaging, is not usually visible (Dickerson, 1970). In recent years there has been a growing awareness that the continued exposure to noise in the course of everyday work may lead to significant reductions in accuity of hearing and may result in permanent damage to the hearing mechanism of an individual (Burns and Robinson, 1970). Industrial equipment noise has long been

considered in many plant safety programs. However, additional attention to industrial noise has resulted from the provisions of the Walsh-Healey Act of 1969 which established noise exposure limits for employees of industries having contracts with the Federal Government. Other Federal regulations, such as the Noise Control Act of 1972, have also brought to the spotlight the importance of noise and its effects in the industrial environment.

Defining Noise

One of the major problems in the scientific research of noise concerns the definition of the word "noise". In reviewing the literature on noise, many definitions are found: Burns (1968) referred to noise as "a broad-band energy without periodicity"; Freeman (1958) called noise "random fluctuations . . . which distort all observations".

The most common and popular definition of noise is "any unwanted sound". Anastasi (1964) said that by such a definition we imply that noise is any sound that is physiologically arousing and harmful, subjectively annoying, or disruptive of performance. Glass and Singer (1972) use Anastasi's (1964) definition as their operational definition of noise. Going into deeper detail, Kryter (1970) proposed the term "perceived noisiness". Perceived noise has as an attribute the subjective impression of the unwantedness of a not unexpected, non-pain or fear-provoking sound as part of one's environment (Kryter, 1970).

Damage Risk Criteria

Critical hearing areas must be defined in order to assess the effects of noise on hearing. According to Dickerson (1970), the International Standards Organization (ISO) has stated that the frequency range that encompasses the major speech frequencies is to be used as the basis for noise induced disability and has suggested that losses of more than 26 dB in sensitivity at 500, 1000, and 2000 Hz define the onset of a hearing impairment. Botsford (1970) states that generally, damage risks are established to protect 90 percent of the population from impairment. According to Kryter et al. (1966), a more conservative exposure-risk criterion tolerates only a 10 dB loss at 1000 Hz, 15 dB at 2000 Hz, and 20 dB at 3000 Hz.

Research work has established two theoretical positions which attempt to determine the energy levels that cause a hearing loss. Dickerson (1970) outlines these two positions. The "equal energy" position bases allowable exposures on the total amount of sound energy entering the ear, without considering the ear's differential sensitivity or its capacity to recover sensitivity after given a rest. The "equal-temporary effect" position, based mainly on the studies of Ward, Glorig and Sklar, (1958; 1959), allows for variations in the ear's sensitivity but assumes a direct relationship between sounds causing a temporary loss of sensitivity (TLS) and a permanent loss of sensitivity (PLS). The assump-

tion is that exposure to noise that causes a TLS that does not recover within 16 hours will eventually lead to a PLS. This may be the case in an individual who returns to a noisy work environment and has not recovered from the effects of his previous exposure, re-exposure will further stress his auditory apparatus and over a period of years cause significant hearing losses (USEPA, 1973).

Loeb (1957) has established a series of curves using the "equal temporary effect" position which defines the maximum safe exposures depending upon the frequency of the sound source. Support of these curves has come from surveys of workers exposed to known work-noise environments (Dickerson, 1970). Their losses after ten years of exposure correspond to those predicted by Glorig et al. (1961) and Nixon & Glorig (1961) in equal-temporary effect studies. From Loeb's (1957) curves, Dickerson (1970) has constructed a table of crude cutoff values for critical sound exposure levels (see Table 1).

Table 1. Critical Sound Exposure Levels*

Sound Level	Effects
78 - 80 dB(A)	Safe
85 dB(A)	Hearing losses begin
90 dB(A)	Serious losses begin
95 dB(A)	50 percent probability
105 dB(A)	losses in all exposed individuals

*These cutoffs refer to damage risks for prolonged exposures to noise over a period of years.

Source: Dickerson, D. D. (Ed.) Transportation noise pollution: Control and abatement. NASA Langley Research Center and Old Dominion University, 1970, p. 21.

CHAPTER II

PHYSIOLOGICAL AND PSYCHOLOGICAL EFFECTS OF NOISE

One of the most fundamental and well-documented effects of noise on humans is the damage it can cause to the auditory mechanism resulting in a loss of hearing. As far as hearing loss due to repeated exposure to high-intensity noise is concerned, there is a large amount of research literature on temporary and permanent threshold shifts (Glorig, 1958; Kryter, 1970, Glass and Singer, 1972) which shows that loud noise can damage the peripheral mechanisms of hearing. There are also studies (e.g. Day, 1970) which have demonstrated auditory fatigue and permanent hearing defects from loud rock-and-roll music.

Noise as a Stressor

Hearing losses may not be the only danger from exposure to noise. Noise can cause the body to activate the autonomic nervous system, which controls many important bodily processes. Noise is responded to as a stress (Dickerson, 1970; Glass & Singer, 1972), and any bodily stress that cannot be effectively coped with will result in severe impairment.

Stress has been generally defined as the affective, behavioral, and physiological response to aversive stimuli

(Appley & Trumbull, 1967). Kryter (1970) states that the word stress, implying an actual or eventual debilitating effect, is often loosely used to signify a state of arousal in an organism. He notes that to distinguish physiologically between conditions of stress and arousal is extremely difficult.

Many environmental events are capable of producing a stress response, and noise is one of such events. The autonomic nervous system, the body's mechanism of defense, is the first to be affected by stress. One of the most significant effects of noise on the autonomic nervous system is a blood circulatory response dominated by vasoconstriction of the peripheral blood vessels (Davis, Buchwald & Frankman, 1955).

Other effects of noise on the autonomic nervous system have been reported in the literature. Audriukin (1961) as reported by Kryter (1970) has presented data which show that the incidence of hypertension tends to be greater in workers exposed to high frequency shrill lathe noise and to very intense broadband noise found in ball bearing manufacturing plants than in men working in less intense noise.

Buyniski (1958) found that deaf employees in a large company (some or perhaps most of whom presumably suffered noise-induced deafness) made a significantly larger number of trips to the company dispensary per year and suffered greater medical pathologies than did employees with normal

hearing. In this study, however, Buyinski failed to define what he meant by "deaf employees".

Also, Brewer and Briess (1960) reported that one non-auditory health problem created by noise is that people working in noise develop coughs, hoarseness, lesions, and pains in their throats from the strain of talking in the noise.

Glass and Singer (1972) state that noise should be studied as a stress factor. The more stresses bearing on man at any given time, the quicker the bodily defenses can be overwhelmed. Emotional states can precipitate the stress reaction (Dickerson, 1970), which is exemplified by the "executive syndrome", involving ulceration, hypertension, cardiovascular diseases, migraine headaches, insomnia, allergic hypertension, and personality disorders (Selye, 1952; 1969). So, noise acting in concert with other forms of stress may also be a significant contributor to poor health (Dickerson, 1970).

Depending on its intensity and duration, noise has been found to have significant effects on man, including an increase in muscular tension, sweating (Davis, 1932), metabolic changes, reduced gastrointestinal activity, headaches, drowsiness, respiratory irregularities and emotional disturbances (Finkle & Poppen, 1948; Jansen, 1969; Smith & Laird, 1930).

Dickerson (1970 p. 22) states that it is clear that

the effort entailed in adapting to aversive events may be achieved at some expense to the individual's behavioral functioning; therefore, task degradations and other impairments of behavior might be expected under the presence of a stressor, and even following its termination.

The stressful effects of noise, according to Glass and Singer (1972), can be measured not only by its effects on task performance, but also by subjective reports of annoyance from persons exposed to the noise. Kryter (1970) stated that the term "perceived noisiness" is synonymous with what is often implied by the word "annoyance". Among the factors affecting the degree of annoyance are such properties of the sound as intensity, frequency, aperiodicity, and unexpectedness (Kryter, 1970).

Effects of Noise on Task Performance

The influence of noise on the performance of certain given task can be easily found in the literature. Glass and Singer (1972) reviewed much of what is known about the effects of noise upon human performance in simple tasks. They summarized that:

(1) In most cases, noise does not affect task performance or psychophysiological reaction.
(2) Even when the noise is made especially aversive by presenting it unpredictably or in circumstances where the subject has no control over it, the noise does not prevent either behavioral or autonomic adaptation.
(3) The only occasions when the noise produces task decrements are those in which the individual is working on a highly complex task or is engaged in a vigilance type task; even then, only

> unpredictable or uncontrollable noise will disrupt performance.

Other researchers have focused on more complex tasks, such as vigilance and arithmetic performance (Childs and Halcomb, 1972, Wolf & Weisner, 1972). For example, Woodhead (1964) found that bursts of 100 dB noise affected performance in arithmetic. Gulian (1971) using an auditory vigilance task found that introverts made a larger number of errors in the quiet condition than in the noise condition; the opposite was observed for extraverts. Gulian (1971) also found that extraverts had more tolerance to noise as measured by GSR. Broadbent and Little (1960) found that noise reduction from 99 dB to 89 dB did not improve production of rate of work, however, a "general morale factor" was improved. They also found that human error is less frequent when the noise level is less.

Weinstein (1974) employing a proofreading task under two conditions, quiet or 70 dB intermittent teletype noise, found that the two groups did not differ in detecting spelling errors, however, the noise subjects were poorer at identifying grammatical errors.

Noise has been found to have a positive effect in situations where it stimulates that individual to remain alert on an otherwise boring task (McGrath and Hatcher, 1961), or where it masks other distracting sound (Rodda, 1967). Noise has also been found to have an effect on arousal. Wilkinson (1969) showed that noise arouses a sleep-

deprived subject to perform better than under quiet conditions. Samuel (1964) showed that performance in a shifting attention task was better under noise conditions (110 dB) than in quiet. Carpenter, in 1964, reported that noise may increase arousal if the individual's arousal is low, however, if the individual's arousal is already at a high point, then it will reduce effectiveness. Azrin (1958) reported that high-intensity sound can become an aversive stimulus and reduce performance quality if it becomes associated with incorrect behavior. Azrin has also shown that noise can facilitate task performance if it is perceived as rewarding, or contains information relevant to the task.

Kryter (1970, p. 556) suggested that experimental results showing noise-induced task degradations, such as a vigilance task, may be attributable to such "stimulus and response contingency interpretations of the meaning of the noise by the subjects". That is, a task may become disliked and poorly performed because it is seen as contingent on the noise. In other words, Kryter seems to imply that the context in which the noise occurs is a principal determinant of its effect on the performance of a given task (Glass and Singer, 1972, p. 16).

It is the author's contention that Azrin's (1958) findings and Kryter's (1970) viewpoint are very much in agreement, and that in a similar way they compare to Clore

and Byrne's (in press) proposed "Reinforcement-Affect Model" for interpersonal judgments and attraction, which stipulates that "stimuli associated with affect influence attraction". They state that "when communications or information from a stranger are associated with the subject's own discomfort, the stranger will be liked significantly less than under comfortable conditions".

What are the effects of noise, if any, on decision-making behavior? Not much evidence has been found relating to this question, although other environmental variables such as ambient temperature and population density have been investigated in detail. For example, Griffitt and Veitch (1971) became interested in the effects of environmental factors upon interpersonal judgments. They hypothesized that ambient temperature, noise level, and population density would have an effect on interpersonal judgments. Griffitt (1970) found that subjects in a hot, uncomfortable room rated strangers significantly lower on attraction than did subjects in a cool, comfortable room. In 1971, Griffitt and Veitch replicated these findings. In their study, Griffitt and Veitch (1971) also found that population density was significantly related to judgments of attraction. Subjects in a crowded room rated strangers significantly lower on attraction than did subjects in a less crowded room. Byrne and Griffitt (1969) established that attitude similarity had a significant effect on interpersonal judgments; they found that subjects that had

similar attitudes were rated higher on attraction.

Baskett (1973) found that attitude similarity significantly influenced judgments concerning starting salaries when subjects were asked to evaluate a candidate for a position as a vice-president during a simulated personnel manager task; subjects with similar attitudes as that of the candidates recommended higher starting salaries for candidates.

Bull et al. (1972) found that noise did not influence attraction; however, they stated that the interaction of sex, noise and similarity was found to be significant. They found that males showed more differentiation of attraction as a function of degree of similarity under control than under noise conditions, whereas females did just the opposite.

CHAPTER III

STATEMENT OF THE PROBLEM

Comprehensive reviews of systematic research on noise (Kryter, 1950, 1970; Broadbent, 1957) conclude that there is no compelling evidence of adverse effects of noise, per se, on mental and psychomotor performance, providing the tasks do not involve auditory communication. A typical explanation of the null effect is that man adapts to the noise, and any initial task deficits soon disappear.

However, according to Glass and Singer (1972, p. 44) "the only occasions when noise produces task decrements are those in which the individual is working on a highly complex task ..." An example of a highly complex task which may be affected by the presence of noise is the task of making subjective judgments or decisions similar to those made by a personnel manager or administrator in industry.

Industrial and Engineering Psychology are relatively silent on this research question. The emphasis has been placed on the physiological effects of noise, as has been noted in the review of the literature. Arauz and Sauser (1973) conducted two simulation studies in an attempt to find the effects of office noise upon decisions made by personnel managers concerning starting salaries for employment candidates. The first study indicated a significant

difference between the salaries that were recommended by individuals under the different conditions (Noise - Quiet). The results showed that subjects in the Noise condition (75 $\pm$ 5 dB) recommended lower starting salaries for bogus applicants. A replication of the study did not show such differences in recommended starting salaries. A possible explanation for the failure of the replication is the fact that the experimenters were unable to maintain the temperature constant; in addition, random, uncontrollable outside noises disturbed the experiment. Thus, several research questions remain unanswered relating to the effects of noise on this type of behavior.

Based on the results of the Arauz and Sauser (1973) studies, and on the "Reinforcement-Affect Model" proposed by Clore and Byrne (in press), it was felt that the presence of loud office noise would affect judgments concerning starting salaries for the bogus applicants. That is, the starting salaries recommended by subjects in the Noise condition would be significantly different from those recommended by subjects in the Quiet condition ($\mu_N \neq \mu_a$).

Since Kryter (1970) stated that "perceived noise" was synonymous with annoyance, the author employed an annoyance scale developed by Pearson and Hart (1968) and modified by Goodman (1974). It was hypothesized that the annoyance scale scores for subjects in the Noise condition would be significantly higher than the scores for subjects in the

Quiet condition ($\mu_N > \mu_Q$).

It was further hypothesized that there would be no significant differences between students' and administrators' salary recommendations or between their annoyance scale scores ($\mu_{AS} = \mu_{SS}$), ($\mu_{AA} = \mu_{SA}$).

CHAPTER IV

METHOD OF INVESTIGATION

Subjects

A total sample of sixty subjects was used in this study. The sample included twenty personnel administrators from the metropolitan Atlanta area (14 males and 6 females; mean ages: 35.7 and 32.3 respectively). The personnel administrators were personally recruited by the author and volunteered to participate in the study. They were experienced in business and industrial policies and procedures, and occupied positions that required decisions and judgments affecting other personnel (i.e. performance evaluations, salary recommendations, etc.).

The sample also included forty undergraduate students currently enrolled in psychology courses at the Georgia Institute of Technology. These students volunteered to participate in the study via sign-up sheets, and received class credit for their participation.

The Experimental Room

The study was conducted in a well-insulated room (see Figure 1), furnished in such a manner as to simulate a personnel manager's office in an industrial setting. The furniture consisted of a desk, executive chair, a coffee table with

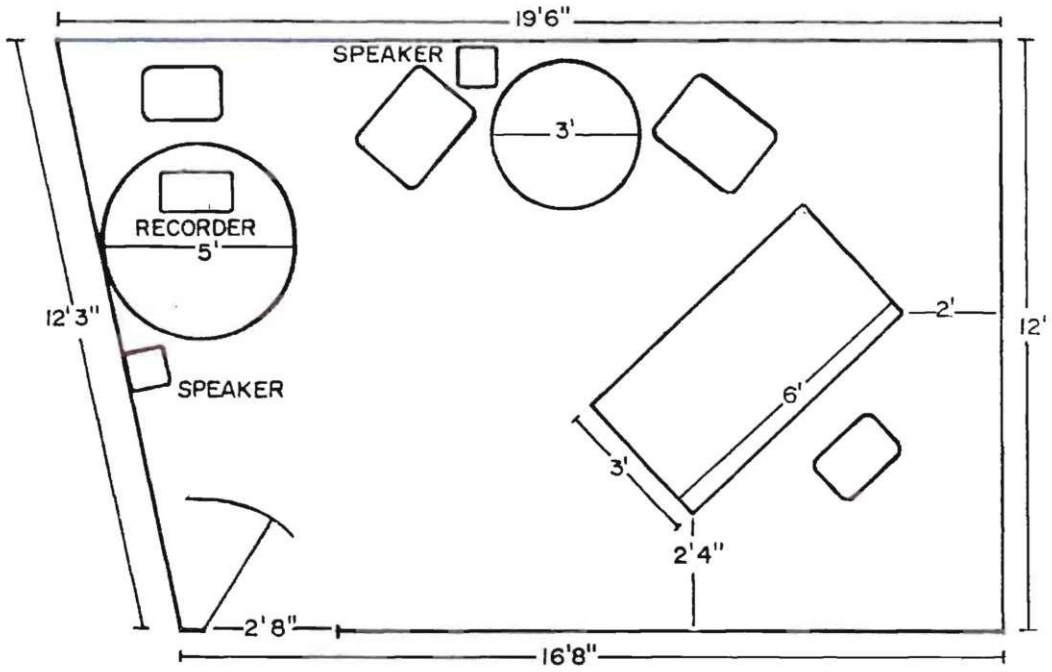

Figure 1. Diagram of the Experimental Room

two matching easy chairs, and a larger conference table with chairs. The room had attractive draperies covering the outside glass wall, and was decorated with a potted plant and various paintings on the other walls.

The experimenter was seated at the conference table throughout the experiment. The tape recorders were placed on top of the conference table in front of the experimenter. The stereo speakers were camouflaged and could not be seen by the subjects.

Equipment

Two tape recorders were used in this experiment. For the office noise tape, a Sony Model #TC353, stereo tape recorder was used; the instructions were played on a Bigston Compact Cassette, Model BR-200. Time was measured by a Lucien Piccard timepiece, and a Breno stopwatch. The sound level was measured by a General Radio Sound Level Meter, Type 1565-B. The soundlevel meter was set at "A-Slow" which is the setting required by Federal regulations for the measurement of industrial noise.

Materials used in the Experiment

First, subjects were given an Instruction sheet (see Appendix A). The article titled "The Personnel Administrator of the 1970's" (Johnson, 1971) was used as a 15-minute preliminary reading task. After this task, the subject was given the "Memo from the Accounting Department" (see Appendix

B) with the resumés of six bogus applicants (see Appendix C). The order of presentation of the resumés was randomized since the literature on this subject is unclear. Hakel, Ohnesorge & Dunnette (1970) have said that contrast effects are not significant on interviewers' decisions. However, another study shows that contrasts may have significant effects, accounting for up to 80% of the total variance (Waxley, Yukl, Kovacs, & Sanders, 1972).

No negative information was given in any of the resumés, since it has been found (Hollman, 1972) that interviewers do not place sufficient weight on positive information when compared to negative information.

The annoyance scale used was Goodman's (1974) modification of Pearson and Hart's (1968) annoyance scale (see Appendix D). It is a 28-point scale on annoyance from noise, ranging from "Not Noticeable" to "Unbearable and intolerable".

A biographical questionnaire (see Appendix E) which included questions on age, occupation, and hearing defects was also used in this study.

Procedure

Subjects were randomly assigned to one of two experimental conditions: the "Noise" condition (office noise at 75 $\pm$ 5 dB) and the "Quiet" condition (office noise at 55 $\pm$ 5 dB).

Both conditions were achieved by playing a tape recording of office noise taken at a large Atlanta business

corporation. The volume of the tape recording was varied for the two conditions. Lighting, humidity, temperature, and population density were maintained constant throughout the experiment. One subject at a time was run through the experiment.

The background noise tape recording, at the selected level, was started before the subject entered the experimental room.

The subject was seated at a desk where he first received the instructions to the experiment. The instructions were given via a tape recording; in addition, the subject was also given an instruction sheet and was asked to read along with the recording. Subjects under both conditions were informed that "normal" office conditions and environment were being simulated. The subject was then given a 15-minute task reading an article titled "The Personnel Administrator of the 1970's" (Johnson, 1971). This article has a certain amount of face validity as far as personnel management is concerned. This 15-minute task was included in the study so that the subjects would have sufficient time to adapt to the "Noise" or "Quiet" conditions. A second purpose of this task was to overcome a problem that is very frequently found in the noise literature": the fact that the tasks used in most studies are not of sufficient duration for noise to have an effect.

Following this 15-minute task, the subject was given

the "Memo from the Accounting Department", which included the resumés of six bogus applicants. The order in which the resumés were presented was random. The subject then proceeded to evaluate and recommend starting salaries for each of the six bogus applicants.

At the end of this task, the salary recommendations were collected, and the subject was asked to complete the annoyance scale for noise. Upon completion of the annoyance scale, the subject was asked to fill out the biographical information questionnaire. The experiment was terminated and the subject was debriefed upon completion of this final task. The duration of the experiment ranged from 35 to 45 minutes.

CHAPTER V

ANALYTICAL RESULTS

Analysis of the Data

Scores Used

The six starting salaries recommended by each subject were averaged, and the mean recommended salary was used as the subject's score.

The subject's annoyance rating was used as his annoyance score. The annoyance scale was scored in such a way that the higher the perceived annoyance, the higher the subject's annoyance scale score.

Tests of Hypotheses

A 2 X 2 Factorial Analysis of Variance design was used for testing the hypotheses presented in Chapter III. Cramer's (1967, 1973) MANOVA program was used to perform the analysis on the Univac 1108 computer.

Two analyses of variance were performed using MANOVA. In the first analysis, effects of office noise were tested using recommended starting salaries. In the second analysis, the effects of office noise were tested using annoyance scale scores. In addition to the above two analyses, a 2 X 2 Factorial analysis of covariance was used for testing the effects of office noise using recommended starting salaries,

while partialling out the effects of annoyance. Significance was tested at $\alpha = .01$. Results of the two analyses of variance and of the analysis of covariance are summarized below. A copy of the MANOVA printout is contained in the files of the School of Psychology.

Analysis of Variance

The mean scores and standard deviations for all four groups are shown in Table 2. An examination of Table 2 reveals that subjects in the Quiet contition (both administrators and students) appear to recommend higher starting salaries than those in the Noise condition. It also appears that, as expected, the annoyance scores for subjects in the Quiet condition were much lower than for those in the Noise condition.

Tables 3 and 4 summarize the results of analysis of variance testing the effects of office noise using recommended starting salaries and annoyance scores, respectively. Using the previously established criterion of $\alpha = .01$, the results confirm the first hypothesis stated in Chapter III: subjects in the Noise condition recommend starting salaries significantly different from those recommended by subjects in the Quiet condition (Table 3).

The results also confirm the second hypothesis, which stated that annoyance scale scores would be significantly higher for subjects in the Noise condition (Table 4). It can also be seen from the results, that Group (Administra-

Table 2. Mean Scores and Standard Deviations for all Four Groups.

Group	Condition	Salary		Annoyance	
		Mean	SD	Mean	SD
Administrators	Noise	9557.50	451.95	14.5	4.30
Administrators	Quiet	10899.50	1145.28	4.2	1.75
Students	Noise	10082.45	842.75	14.8	7.35
Students	Quiet	10573.25	944.48	9.35	5.51

Table 3. Analysis of Variance Table for Testing the Effects of Office Noise using Recommended Starting Salaries.

Source	SS	df	F	P less than
Within Cells	44086468.00	56		
T*	8998530.25	1	11.430	.001
G**	131605.53	1	.167	.684
TXG	2415137.94	1	3.068	.085

*Treatment (Noise vs. Quiet)

**Group (Administrators vs. Students)

Table 4. Analysis of Variance Table for Testing the Effect of Office Noise using Annoyance Scale Scores.

Source	SS	df	F	P less than
Within Cells	1795.850	56		
T	759.067	1	23.36	.001
G	99.008	1	3.09	.084
TxG	78.408	1	2.45	.124

tors vs. Students) did not have a significant effect, as was hypothesized in Chapter III. Thus, it appears that the difference in recommended starting salaries observed in this study can be mainly attributed to the presence of office noise.

Analysis of Covariance

The results of the analysis of covariance are summarized in Table 5. The results show that noise still has a significant effect on recommended starting salaries even if the annoyance variable is partialled out. This is an extremely interesting finding, since it appears that reported annoyance is not the only factor contributing to the effects caused by noise.

It should be noted that the analysis of covariance was weakened by the fact that the covariate, perceived annoyance, was not independent from the recommended salaries. The correlation coefficient was - .18.

Magnitude of the Estimate

It was found that the Noise treatment accounted for 26% of the variance on the annoyance scale scores, and 14.6% of the variance on the recommended starting salaries.

Table 5. Summary Table of the Analysis of Covariance -- Testing the Effects of Office Noise on Recommended Starting Salaries, Partialling Annoyance.

Source	SS	df	F	P less than
Within Cells	43843245.50	55		
Regression	243222.57	1	.305	.583
T	7769971.00	1	9.747	.003
G	57810.00	1	.073	.789
TxG	2631172.00	1	3.301	.075

CHAPTER VI

DISCUSSION OF THE FINDINGS

The results show that office noise (at 75 $\pm$ 5 dB) had an effect on starting salaries recommended by subjects in this experiment. Subjects in the Noise condition recommended significantly lower starting salaries for the bogus applicants than did subjects in the Quiet condition. These results confirm the findings of the first study by Arauz and Sauser (1973).

Evaluating applicants and recommending starting salaries for them is a highly complex decision-making task. The findings of this study lend support to Glass and Singer's (1972, p. 44) statement: "The only occasions when the noise produces task decrements are those in which the individual is working on a highly complex task ..."

The finding that noise has an effect on the decisions made concerning starting salaries for applicants is consistent with the results of the studies by Griffitt (1970) and Griffitt and Veitch (1971), where it was found that environmental variables have a significant effect upon interpersonal judgments.

It is felt that the annoyance rating obtained from the subjects in this study comes very close to the meaning

of the word "annoyance" that Kryter (1970, p. 271) stated was synonymous with "perceived noisiness". The subjects in the present study were asked to rate, at the end of the experiment, how annoying was the noise that was present throughout the experiment. They were not asked to compare it to any other given noise. It can, therefore, be assumed that the annoyance rating given by the subjects was an indicator of their "perceived noisiness" of the experimental environment. If this assumption is true, then the results of the analysis of covariance raise some important questions.

The results showed that even when the effects of the annoyance variable were partialled out, the salaries recommended by subjects in the Noise condition were significantly lower ($p < .01$) than those recommended by subjects in the Quiet condition. In other words, the treatment had a significant effect on the decisions made by the subjects. This is an important point because these findings suggest that the effects of noise that have been found in other studies (e.g. Woodhead, 1964, Weinstein, 1974) may not be due in their entirety to the annoyance caused by the noise. The results seem to indicate that other variables outside of annoyance or "perceived noisiness" may be involved in the effects that noise may have on task performance. More research is needed in this area in order to determine which variables are involved in the effects that noise may have on complex task performance.

The results obtained in this study appear to disagree with the conclusions of Kryter (1950; 1970) and Broadbent (1957) who feel that there is no compelling evidence of adverse effects of noise per se on mental and psychomotor performance. They have stated that most effects of noise disappear after adaptation. However, in the present study, a period of time was allowed for adaptation, while at the same time, the type of noise that was used in the experiment was familiar to all subjects, and the level used in the Noise condition (75 $\pm$ 5 dB) is the approximate noise level in large business offices.

The findings of this study also seem to give a certain amount of support to Clore and Byrne's (in press) proposed "Reinforcement-Affect Model" for interpersonal judgments and attraction that was mentioned in Chapter II.

Another interesting result that may be of help to researchers in this area was the finding that there were no significant differences between the salaries and ratings obtained from student subjects and those obtained from administrators.

The literature has shown that the human body reacts to noise in the same manner as it reacts to other known stresses. Individuals react differently when subjected to stressful situations. If we regard noise as a stressor, it can be assumed that individual differences will be encountered in its effects. Annoyance may be just one of

many variables involved in the effects of noise on man and his performance in complex tasks. Other variables, such as sex, age, personality traits, and customary environment may play an important role in the effects of noise.

There is an obvious need for further research in the area of noise and its effects on human performance. This type of research would be of great help in the establishment of noise control guidelines, not only for industry, but also for transportation and community noise standards.

APPENDIX A

The Instruction Sheet

INSTRUCTIONS.

This is a personnel manager simulation experiment. You are to pretend that you are a personnel manager for a large Atlanta-based corporation. It is 9:00 A.M. and you have just arrived at your office. You are expecting to receive a memo from the Accounting Department concerning starting salaries for new employees. Meanwhile, you have decided to begin reading a copy of Johnson's article titled "The Personnel Administrator of the 1970's". This article was recommended to you, by your immediate superior, to read when you had a chance (when your desk was clear).

When the memo from the Accounting Department arrives, you will, of course, begin to work on it immediately. When finished with the memo, put it aside and continue reading.

This experiment will last approximately 35 minutes.

APPENDIX B

Memo from the Accounting Department

INTEROFFICE MEMO

TO: PERSONNEL MANAGER

FROM: VICE-PRESIDENT - ACCOUNTING DEPARTMENT

SUBJECT: STAFFING

Upon recommendation from your department, the six applicants whose resumes are attached have been hired to fill positions in our Accounting Department. As you know, our usual starting salaries for accounting positions usually range from $8,500 to $16,000 per year. Please recommend starting salaries for each of the men.

Applicant	Recommended salary
#1 Thomas A. Brown	$ per year
#2 William J. Randolph	$ per year
#3 Jack R. Chambers	$ per year
#4 Robert W. Miller	$ per year
#5 Darrel W. Griffin	$ per year
#6 John M. Medina	$ per year

APPENDIX C

Resumes of Six Bogus Applicants

APPLICANT # 1

Name: Thomas A. Brown

Date of Birth: April 15, 1947

Marital Status: Single

Number of dependents: 0

Education: High School: Central High School, Raleigh, N.C.
College: University of North Carolina, Chapel Hill, N.C.
Degree: B.A. in Business Administration
Date of Graduation: December, 1969.

Extra-curricular Activities in College:
Tau Kappa Theta Fraternity
Alpha Sigma Pi Business Fraternity
Newspaper Sports Editor

Hobbies: Tennis, Water-skiing, Music.

Previous Work Experience:
Sears, Roebuck and Company, Raleigh, N.C.
Junior Accountant, January 1970 to present.
Starting salary: $6,000
Salary when leaving: $7,500

Job desired: Accountant

Recommendation rating: Above-average

APPLICANT #2

Name: William J. Randolph

Date of Birth: January 23, 1946

Marital Status: Divorced

Number of dependents: 1

Education: High School: Miami High School, Miami, Fla.
College: University of Miami, Florida
Degree: B.A. in Accounting
Date of Graduation: June, 1969

Extra-curricular Activities in College:
Lambda Kappa Delta Fraternity
Accounting Club
"Hurricane" Pep Club
Debating Team

Hobbies: Water-skiing, swimming, diving, handball.

Previous Work Experience:
Caribbean Imports Company, Ft. Lauderdale, Fla.
Accountant and Bookkeeper, April 1971 - March 1974
Starting salary: $6,450
Salary when leaving: $7,850

Stanley Aluminum Corp., N. Miami, Fla.
Asst. Accountant, September 1969 - March 1971
Starting salary: $5,500
Salary when leaving: $6,300

Job desired: Accountant

Recommendation rating: Average

APPLICANT #3

Name: Jack R. Chambers

Date of Birth: June 8, 1950

Marital Status: Married

Number of dependents: 2

Education: High School: John L. Park High School, Dover, Del.
College: State University of New York, Stonybrook, New York.
Degree: B.S. in Management
Date of Graduation: June 1973

Extra-curricular activities in College:
Student Government Senator
Junior Accountants Association

Hobbies: Golf, tennis, swimming.

Previous Work Experience:
New York State National Guard, June 1973 - January 1974.

Arco Diversified Industries, Stonybrook, N.Y.
Junior Accountant (Part-time: 20 hours/week)
June 1970 - June 1973
Starting salary: $2,400
Salary when leaving: $2,850

Job desired: Accountant

Recommendation rating: Superior

APPLICANT #4

Name: Robert W. Miller

Date of Birth: October 25, 1941

Marital Status: Married

Number of dependents: 3

Education: High School: West Side High School, Kansas City, Kansas.
College: Illinois State University, Chicago, Ill.
Degree: B.A. in Accounting
Date of Graduation: June 1966

Extra-curricular Activities in College:
Pi Psi Omega Fraternity
Dramatics Club

Hobbies: Bowling, dancing, music.

Previous Work Experience:
Topeka Manufacturing Company, Topeka, Kansas
Accounts Manager, June 1969 - February 1974
Starting salary: $6,850
Salary when leaving: $8,775

Kress and Norwood, Inc., Chicago, Ill.
Asst. Accountant, September 1966 - May 1969
Starting salary: $5,575
Salary when leaving $6,650

Job desired: Accountant

Recommendation rating: Average

APPLICANT #5

Name: Darrel W. Griffin

Date of Birth: May 7, 1937

Marital Status: Married

Number of dependents: 3

Education: High School: Desert Heights High School, Yuma, Ariz.
College: Northern Arizona University, Flagstaff, Ariz.
University of San Diego, San Diego, Cal.
Degree: B.S. in Accounting
Date of Graduation: June, 1963

Extra-curricular Activities in College:
AFROTC
Arnold Air Society
Football Team

Hobbies: Sports (all), Boy Scout Leader

Previous Work Experience:
Gulf Oil Company, Corpus-Christi, Texas
Credit Sales District Manager, September 1967 to present
Starting salary: $7,250
Salary when leaving: $10,575

United States Air Force, Captain (Launching Pad Officer), August 1963 - July 1967 . (Currently in USAF Reserve)
Starting salary: $6,275
Salary when leaving: $8,340

Job desired: Accountant

Recommendation rating: Superior

APPLICANT #6

Name: John M. Medina

Date of Birth: November 3, 1941

Marital Status: Married

Number of dependents: 4

Education: High School: San Jacinto High School, Taos, N.M.
College: University of New Mexico, Albuquerque, New Mexico.
Degree: B.S. in Accounting
Date of Graduation: June, 1965

Extra-curricular Activities in College:
Junior Accountants Society

Hobbies: Hiking, camping, fishing.

Previous Work Experience:
Bailey, Neeman & White, Accountants, El Paso, Tex.
Accountant, January 1970 to present.
Starting salary: $6,450
Salary when leaving: $8,875

Latin Imports, Albuquerque, New Mexico
Accountant, September 1965 - November 1969
Starting salary: $4,975
Salary when leaving: $6,575

Job desired; Accountant

Recommendation rating: Average

APPENDIX D

Annoyance Scale

INSTRUCTIONS: Please mark on the scale below how annoying was the noise throughout the experiment.

HOW ANNOYING WAS THE NOISE?

____UNBEARABLE AND INTOLERABLE

____EXTREMELY ANNOYING

____VERY ANNOYING

____QUITE ANNOYING

____ANNOYING

____MODERATELY ANNOYING

____SOMEWHAT ANNOYING

____SLIGHTLY ANNOYING

____NOTICEABLE BUT NOT OBJECTIONABLE

____NOT NOTICEABLE

APPENDIX E

Biographical Questionnaire

INSTRUCTIONS.

Please fill out this questionnaire as completely and accurately as you can. All answers will be held in the strictest confidence. DO NOT write your name on this sheet.

Birthdate:_____

Occupation:_____

Do you have any hearing deficiency?_____

If "Yes", please explain:_____

_____

Approximate population of the city or town where you have lived for the longest period of time:_____

Please rate the noisiness of your environment AT WORK: (circle one)

Very Quiet	Quiet	Relatively Quiet	Average	Relatively Noisy	Noisy	Very Noisy

AT HOME:

Very Quiet	Quiet	Relatively Quiet	Average	Relatively Noisy	Noisy	Very Noisy

In a few words, please describe how you arrived at the recommended starting salaries:

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